

OPERATIONS RESEARCH

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10x2 = 20)

- 1 Define Feasible solution and Optimal Solution.
- 2 What is Duality?
- 3 What do you mean by unbalanced transportation model?
- 4 Define the unbalanced assignment problem.
- 5 Define grouped replacement.
- 6 Write the formula for average annual cost of replacement problem.
- 7 Define arrival time.
- 8 Define Service time.
- 9 What is a Project?
- 10 What are the characteristics of a good network representing a project?

SECTION - B (25 Marks!)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5x5 = 25)

- 11 a Describe Simplex method for solving linear programming problem.

OR

- b Applying graphical method to solve the LPP.

$$\text{Max } z = x_1 - 2x_2$$

$$\text{st., } -x_1 + x_2 \leq 1, 6x_1 - 3x_2 \geq 24, 0 < x_1 < 5 \text{ and } 2 < x_2 < 4 \text{ and } x_1, x_2 \geq 0$$

- 12 a Obtain an initial basic feasible solution to the following transportation problem using the matrix minima method.

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Capacity
O <sub>1</sub>	1	2	3	4	6
O <sub>2</sub>	4	3	U.	0	8
O <sub>3</sub>	0	2	2	1	10
Demand	4	6	8	6	

OR

- b An oil engine manufacturer purchases lubricants at the rate of Rs.42 per piece from a vendor. The requirement of these lubricant, is 1800 per year. What should be the order quantity per order, if the cost per replacement of an order is Rs.16 and inventory carrying charge per rupee is only 20 paise.

- 13 a Write short notes on group replacement and individual replacement policies.

OR

- b Let  $v=0.9$  and initial price is Rs.5,000. Running cost varies as follows:

j Year	1	2	3	4	5	6	7
Running Cost	400	700	1000	1300	1700	2100	

What should be the optimum replacement interval?

day. Assuming that the inter-arrival time follows an exponential distribution and the service time distribution is also exponential with an average 36 minutes. Calculate the mean square size.

OR

- b Explain briefly the important characteristic of queuing system.
- 15 a Draw the event oriented network for the following data.

Event no	1	2	3	4	5	6	7
Immediate Predecessor		1	1	2,3	3	4,5	5,6

OR '..... ~

- b Write short note on (i) Activity (ii) Dangling (iii) Dummy activity (iv) Activity on arrow diagram

**SECTION - C (30 Marks)**

Answer any THREE Questions

ALL Questions Carry EQUAL Marks (3 x 10 = 30)

- 16 Solve the following  

$$\text{Max } z = -15x_1 + 6x_2 - 9x_3 - 4x_4$$

$$\text{s.t., } 2x_1 + x_2 - 5x_3 - 6x_4 < 20$$

$$3x_1 - x_2 + 3x_3 - 2x_4 < 24$$

$$7x_1 + x_4 < 70$$

$$x_1, x_2, x_3, x_4 > 0.$$

- 17 Solve transportation problem,

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	Supply (unit)
A	5	6	9	100
B	3	5	10	75
C	6	"	6	50
D	6	4	10	75
Demand (units)	70	80	120	

- 18 On an average 96 patients per 24 hour day require the service of an emergency clinic. Also on an average, a patient requires 10 minutes of active attention assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs. 100 per patient treated to obtain an average servicing time of 10 minutes, and that each minute of decrease in this average time would cost Rs.10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from 10 patients to Q, a patient.

- 19 Find the cost per period of individual replacement policy of a installation of 200 light bulbs, given the following  
 (i) cost of replacing an individual bulb is Rs.3.

Week no	1	2	3	4
Conditional Probability of failure	0.1	0.3	0.7	0.1

- 20 The following table lists the jobs of a network along with their time estimates

Jobs	1-2	1-3	2-4	3-4	4-5	3-5
Optimistic time	2	1	9	5	2	6
Most likely time	5	12	14	5	6	17
Pessimistic time	14	15	17	8	20	

- a) Draw the network  
 b) Calculate the length and variance of the critical path  
 c) Find the probability that the project will be completed within 30 days?

Z-Z-Z

END